Alfalfa (*Medicago sativa* L.) Breeding & Selection Under Heavy Grazing: Effects on Persistence in Non-Dormant Varieties

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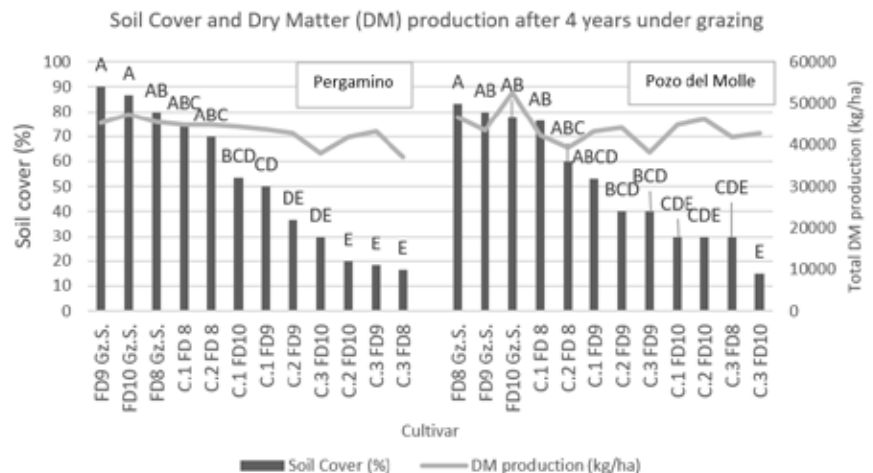
Introduction: Lucerne is the most important forage legume species in the world. More than 90% of alfalfa is used under grazing systems on dairy and beef farms in Argentina. The main objectives of alfalfa breeding programs are forage yield, nutritive value, and improved tolerance to abiotic and biotic factors. Persistence is a critical factor to increase forage production through the years, and plants losses are higher in grazing systems compared with cut and carry systems. Also, most alfalfa cultivars are not tolerant to frequent defoliation. The main objective of this breeding program is to obtain non-dormant cultivars (fall dormancies [FD] 8 to 10) with long term (i.e. 4 years) persistence under heavy and frequent grazing systems, achieving high dry matter production, and leaf disease resistance.

Materials and Methods: Surviving plants from Trenque Lauquen (TQ) and Pergamino (PE) (Argentina) were selected from plots under frequent and heavy grazing (cows at TQ and sheep at PE) three years after establishment. Two polycross cages were carried out in 2017 with plants that excelled in the following criteria: persistence under grazing, phenotype (high quantity of thin and leafy stems), crown size, and disease tolerance for each FD. 64 plants were selected from FD8 and 45 from FD9-10. Harvested seed was proportionally bulked, producing different experimental lines (FD8-FD9-FD10). In 2018 and 2019 agronomic trials were sown in five different sites in Argentina, with 3 replicates each in a Randomized Complete Block Design. Frequent defoliation management were applied at all sites (grazing starting at 8-10 nodes per stem year-round); PE site was defoliated with sheep and Pozo del Molle (PM) with dairy cows. Soil Cover (%), Dry matter production (Kg/ha), and plant height (cm) were registered. ANOVAs were used to analyze differences in soil cover percentage and Tukey tests for means separation (α = 0.10).

Results and Discussion: Significant differences were found in soil cover after 4 year. On average, grazing selections (Gz.S.) had the best performance (83%) when compared against commercial checks (C.; 41%). In addition, yield (dry matter production) along the years is equal or greater than commercial checks.

Conclusions: High differences in persistence under frequent and direct grazing were observed on the Gz.S, maintaining or increasing forage yield. After four years of experimental data, lucerne lines which had been selected under frequent and direct grazing had higher persistence (90%) than those without grazing selection. This highlights the importance of breeding programs conducted under grazing when that is the ultimate use that will be given to such cultivars.

Figure 1. Soil cover (▬) after 4 years in two localities in Argentina and total dry matter production (▬), 38 cuts in each site. Different letter means significant differences between varieties. Gz.S: Grazing selections. C: commercial checks. Fall dormancy (FD) 8, 9 and 10.